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The Hospital Anxiety and Depression Scale: a meta confirmatory factor analysis Appendix A.2.

Sam Norton

July 9, 2012

Meta Confirmatory factor analysis was applied to the Hospital Anxiety and Depression Scale inter-item correlation matrices pooled across 28 samples. Subgroup analyses were performed for community sample, cardiovascular disease samples and studies administering the English language version of the HADS. Ten models are considered, including eight previously identified models and two bifactor models. Models are additionally considered with and without controlling for item wording effects.

The inter-item correlation matrices and model fit statistics for each of the ten models applied to the 28 samples are provided over the following pages.

Pooled correlation matrix, all studies

N = 21820

Table A.2.1: Inter-item correlations

item	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	q11	q12	q13	q14
q1	1.000	0.298	0.491	0.307	0.560	0.419	0.430	0.357	0.434	0.245	0.340	0.315	0.506	0.246
q2	0.298	1.000	0.254	0.438	0.309	0.398	0.352	0.371	0.260	0.265	0.189	0.488	0.271	0.293
q3	0.491	0.254	1.000	0.295	0.539	0.373	0.367	0.310	0.474	0.225	0.303	0.288	0.560	0.229
q4	0.307	0.438	0.295	1.000	0.334	0.475	0.381	0.268	0.287	0.273	0.192	0.484	0.299	0.329
q5	0.560	0.309	0.539	0.334	1.000	0.453	0.424	0.347	0.437	0.263	0.342	0.336	0.517	0.263
q6	0.419	0.398	0.373	0.475	0.453	1.000	0.423	0.345	0.322	0.320	0.235	0.446	0.377	0.334
q7	0.430	0.352	0.367	0.381	0.424	0.423	1.000	0.293	0.361	0.236	0.331	0.373	0.374	0.359
q8	0.357	0.371	0.310	0.268	0.347	0.345	0.293	1.000	0.280	0.275	0.237	0.336	0.345	0.203
q9	0.434	0.260	0.474	0.287	0.437	0.322	0.361	0.280	1.000	0.193	0.290	0.290	0.517	0.231
q10	0.245	0.265	0.225	0.273	0.263	0.320	0.236	0.275	0.193	1.000	0.176	0.343	0.236	0.222
q11	0.340	0.189	0.303	0.192	0.342	0.235	0.331	0.237	0.290	0.176	1.000	0.200	0.380	0.222
q12	0.315	0.488	0.288	0.484	0.336	0.446	0.373	0.336	0.290	0.343	0.200	1.000	0.301	0.351
q13	0.506	0.271	0.560	0.299	0.517	0.377	0.374	0.345	0.517	0.236	0.380	0.301	1.000	0.262
q14	0.246	0.293	0.229	0.329	0.263	0.334	0.359	0.203	0.231	0.222	0.222	0.351	0.262	1.000

Table A.2.2: Fit statistics, no wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	13506.6	77	0.089	0.059	0.863	0.838	782547.1	782770.9
Zigmond and Snaith	5670.9	76	0.058	0.041	0.943	0.932	774713.5	774945.2
Moorey	5196.3	76	0.056	0.038	0.948	0.937	774238.8	774470.6
Friedman	5071.6	74	0.056	0.038	0.949	0.937	774118.2	774365.9
Caci	4878.4	74	0.055	0.038	0.951	0.940	773925.0	774172.7
Brandberg	5894.2	74	0.060	0.041	0.941	0.927	774940.8	775188.5
Dunbar	4599.9	74	0.053	0.037	0.954	0.943	773646.5	773894.2
Dunbar, higher-order	4678.3	75	0.053	0.037	0.953	0.943	773722.9	773962.6
Bifactor, 2 group-factors	2561.2	63	0.043	0.022	0.974	0.963	771629.8	771965.4
Bifactor, 3 group-factors	3905.3	64	0.052	0.033	0.961	0.944	772971.8	773299.5

Table A.2.3: Fit statistics, wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	5170.8	71	0.057	0.041	0.948	0.933	774223.4	774495.1
Zigmond and Snaith	3438.3	70	0.047	0.027	0.966	0.955	772492.9	772772.5
Moorey	3719.8	70	0.049	0.029	0.963	0.951	772774.4	773054.0
Friedman	3170.9	68	0.046	0.026	0.968	0.958	772229.5	772525.1
Caci	2914.3	68	0.044	0.025	0.971	0.961	771972.9	772268.5
Brandberg	3048.4	68	0.045	0.026	0.970	0.959	772107.0	772402.6
Dunbar	2607.1	68	0.041	0.024	0.974	0.965	771665.6	771961.3
Dunbar, higher-order	2609.9	69	0.041	0.024	0.974	0.966	771666.5	771954.2
Bifactor, 2 group-factors	1612.7	57	0.035	0.017	0.984	0.975	770693.3	771076.9
Bifactor, 3 group-factors	2309.5	58	0.042	0.027	0.977	0.964	771388.1	771763.7

Pooled correlation matrix, Cardiovascular samples

N = 2394

Table A.2.4: Inter-item correlations

item	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	q11	q12	q13	q14
q1	1.000	0.304	0.467	0.314	0.546	0.408	0.401	0.316	0.397	0.278	0.336	0.334	0.472	0.224
q2	0.304	1.000	0.231	0.459	0.291	0.364	0.300	0.423	0.247	0.271	0.179	0.513	0.257	0.263
q3	0.467	0.231	1.000	0.333	0.565	0.388	0.382	0.294	0.477	0.258	0.267	0.292	0.578	0.224
q4	0.314	0.459	0.333	1.000	0.346	0.481	0.363	0.328	0.318	0.309	0.177	0.508	0.318	0.293
q5	0.546	0.291	0.565	0.346	1.000	0.432	0.424	0.328	0.435	0.296	0.328	0.350	0.555	0.238
q6	0.408	0.364	0.388	0.481	0.432	1.000	0.419	0.335	0.327	0.334	0.219	0.475	0.406	0.304
q7	0.401	0.300	0.382	0.363	0.424	0.419	1.000	0.270	0.404	0.228	0.278	0.368	0.367	0.343
q8	0.316	0.423	0.294	0.328	0.328	0.335	0.270	1.000	0.277	0.282	0.204	0.379	0.330	0.193
q9	0.397	0.247	0.477	0.318	0.435	0.327	0.404	0.277	1.000	0.233	0.217	0.297	0.479	0.228
q10	0.278	0.271	0.258	0.309	0.296	0.334	0.228	0.282	0.233	1.000	0.170	0.379	0.268	0.191
q11	0.336	0.179	0.267	0.177	0.328	0.219	0.278	0.204	0.217	0.170	1.000	0.211	0.325	0.196
q12	0.334	0.513	0.292	0.508	0.350	0.475	0.368	0.379	0.297	0.379	0.211	1.000	0.343	0.316
q13	0.472	0.257	0.578	0.318	0.555	0.406	0.367	0.330	0.479	0.268	0.325	0.343	1.000	0.280
q14	0.224	0.263	0.224	0.293	0.238	0.304	0.343	0.193	0.228	0.191	0.196	0.316	0.280	1.000

Table A.2.5: Fit statistics, no wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	1591.4	77	0.091	0.059	0.859	0.833	85910.9	86072.7
Zigmond and Snaith	656.8	76	0.056	0.040	0.946	0.935	84978.3	85145.9
Moorey	691.2	76	0.058	0.042	0.943	0.931	85012.7	85180.3
Friedman	578.0	74	0.053	0.037	0.953	0.942	84903.4	85082.6
Caci	569.4	74	0.053	0.037	0.954	0.943	84894.9	85074.1
Brandberg	609.3	74	0.055	0.038	0.950	0.939	84934.7	85113.9
Dunbar	573.8	74	0.053	0.038	0.953	0.943	84899.3	85078.5
Dunbar, higher-order	575.6	75	0.053	0.038	0.953	0.943	84899.1	85072.5
Bifactor, 2 group-factors	339.4	63	0.043	0.023	0.974	0.963	84686.9	84929.7
Bifactor, 3 group-factors	435.9	64	0.049	0.031	0.965	0.951	84781.3	85018.3

Table A.2.6: Fit statistics, wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	746.9	71	0.063	0.046	0.937	0.919	85078.3	85274.9
Zigmond and Snaith	500.6	70	0.051	0.032	0.960	0.948	84834.1	85036.4
Moorey	524.3	70	0.052	0.033	0.958	0.945	84857.7	85060.1
Friedman	457.0	68	0.049	0.030	0.964	0.952	84794.5	85008.3
Caci	434.4	68	0.047	0.028	0.966	0.954	84771.8	84985.7
Brandberg	419.5	68	0.046	0.028	0.967	0.956	84756.9	84970.8
Dunbar	431.1	68	0.047	0.030	0.966	0.955	84768.6	84982.4
Dunbar, higher-order	431.4	69	0.047	0.030	0.966	0.956	84766.9	84975.0
Bifactor, 2 group-factors	237.6	57	0.036	0.019	0.983	0.973	84597.1	84874.5
Bifactor, 3 group-factors	306.8	58	0.042	0.027	0.977	0.964	84664.3	84936.0

Pooled correlation matrix, English language studies

N = 10241

Table A.2.7: Inter-item correlations

item	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	q11	q12	q13	q14
q1	1.000	0.287	0.434	0.304	0.526	0.404	0.428	0.329	0.407	0.237	0.335	0.341	0.488	0.225
q2	0.287	1.000	0.245	0.358	0.288	0.373	0.335	0.440	0.220	0.264	0.171	0.512	0.253	0.233
q3	0.434	0.245	1.000	0.288	0.522	0.356	0.361	0.287	0.497	0.216	0.276	0.301	0.558	0.212
q4	0.304	0.358	0.288	1.000	0.303	0.430	0.354	0.257	0.268	0.244	0.169	0.456	0.289	0.270
q5	0.526	0.288	0.522	0.303	1.000	0.414	0.404	0.320	0.430	0.248	0.325	0.342	0.517	0.235
q6	0.404	0.373	0.356	0.430	0.414	1.000	0.390	0.323	0.281	0.295	0.221	0.446	0.378	0.297
q7	0.428	0.335	0.361	0.354	0.404	0.390	1.000	0.285	0.349	0.238	0.327	0.386	0.379	0.331
q8	0.329	0.440	0.287	0.257	0.320	0.323	0.285	1.000	0.237	0.272	0.214	0.366	0.302	0.178
q9	0.407	0.220	0.497	0.268	0.430	0.281	0.349	0.237	1.000	0.175	0.248	0.271	0.551	0.188
q10	0.237	0.264	0.216	0.244	0.248	0.295	0.238	0.272	0.175	1.000	0.161	0.353	0.237	0.180
q11	0.335	0.171	0.276	0.169	0.325	0.221	0.327	0.214	0.248	0.161	1.000	0.198	0.335	0.205
q12	0.341	0.512	0.301	0.456	0.342	0.446	0.386	0.366	0.271	0.353	0.198	1.000	0.306	0.304
q13	0.488	0.253	0.558	0.289	0.517	0.378	0.379	0.302	0.551	0.237	0.335	0.306	1.000	0.232
q14	0.225	0.233	0.212	0.270	0.235	0.297	0.331	0.178	0.188	0.180	0.205	0.304	0.232	1.000

Table A.2.8: Fit statistics, no wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	6673.0	77	0.091	0.060	0.849	0.821	369949.6	370152.1
Zigmond and Snaith	3027.8	76	0.062	0.043	0.932	0.919	366306.4	366516.1
Moorey	2904.3	76	0.060	0.041	0.935	0.922	366182.9	366392.7
Friedman	2397.2	74	0.055	0.036	0.947	0.934	365679.8	365904.1
Caci	2432.8	74	0.056	0.037	0.946	0.933	365715.3	365939.6
Brandberg	2519.5	74	0.057	0.038	0.944	0.931	365802.1	366026.3
Dunbar	2188.7	74	0.053	0.035	0.951	0.940	365471.3	365695.6
Dunbar, higher-order	2229.9	75	0.053	0.036	0.951	0.940	365510.5	365727.5
Bifactor, 2 group-factors	1360.7	63	0.045	0.024	0.970	0.957	364665.2	364969.1
Bifactor, 3 group-factors	1698.0	64	0.050	0.031	0.962	0.947	365000.6	365297.2

Table A.2.9: Fit statistics, wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	3438.9	71	0.068	0.049	0.923	0.901	366727.5	366973.5
Zigmond and Snaith	2302.1	70	0.056	0.035	0.949	0.933	365592.7	365845.9
Moorey	2401.5	70	0.057	0.035	0.946	0.930	365692.1	365945.3
Friedman	1909.7	68	0.051	0.032	0.958	0.943	365204.3	365472.0
Caci	1945.6	68	0.052	0.032	0.957	0.942	365240.2	365507.9
Brandberg	1789.0	68	0.050	0.030	0.960	0.947	365083.6	365351.3
Dunbar	1626.8	68	0.047	0.029	0.964	0.952	364921.4	365189.1
Dunbar, higher-order	1630.5	69	0.047	0.029	0.964	0.953	364923.1	365183.6
Bifactor, 2 group-factors	819.5	57	0.036	0.019	0.982	0.972	364136.1	364483.4
Bifactor, 3 group-factors	955.8	58	0.039	0.026	0.979	0.968	364270.4	364610.4

Pooled correlation matrix, Community samples

N = 11614

Table A.2.10: Inter-item correlations

item	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	q11	q12	q13	q14
q1	1.000	0.210	0.440	0.200	0.516	0.344	0.374	0.322	0.352	0.160	0.300	0.202	0.475	0.159
q2	0.210	1.000	0.170	0.277	0.220	0.271	0.265	0.283	0.177	0.160	0.134	0.362	0.211	0.195
q3	0.440	0.170	1.000	0.178	0.465	0.285	0.296	0.276	0.395	0.164	0.264	0.187	0.495	0.133
q4	0.200	0.277	0.178	1.000	0.214	0.330	0.260	0.157	0.178	0.182	0.134	0.347	0.208	0.216
q5	0.516	0.220	0.465	0.214	1.000	0.367	0.357	0.310	0.348	0.190	0.292	0.237	0.466	0.172
q6	0.344	0.271	0.285	0.330	0.367	1.000	0.314	0.275	0.233	0.227	0.187	0.305	0.315	0.231
q7	0.374	0.265	0.296	0.260	0.357	0.314	1.000	0.242	0.285	0.167	0.288	0.275	0.326	0.266
q8	0.322	0.283	0.276	0.157	0.310	0.275	0.242	1.000	0.223	0.216	0.207	0.244	0.314	0.129
q9	0.352	0.177	0.395	0.178	0.348	0.233	0.285	0.223	1.000	0.119	0.242	0.192	0.458	0.141
q10	0.160	0.160	0.164	0.182	0.190	0.227	0.167	0.216	0.119	1.000	0.151	0.242	0.183	0.127
q11	0.300	0.134	0.264	0.134	0.292	0.187	0.288	0.207	0.242	0.151	1.000	0.140	0.356	0.159
q12	0.202	0.362	0.187	0.347	0.237	0.305	0.275	0.244	0.192	0.242	0.140	1.000	0.209	0.246
q13	0.475	0.211	0.495	0.208	0.466	0.315	0.326	0.314	0.458	0.183	0.356	0.209	1.000	0.171
q14	0.159	0.195	0.133	0.216	0.172	0.231	0.266	0.129	0.141	0.127	0.159	0.246	0.171	1.000

Table A.2.11: Fit statistics, no wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	5005.3	77	0.074	0.055	0.862	0.837	430555.7	430761.8
Zigmond and Snaith	2586.9	76	0.053	0.040	0.930	0.916	428139.3	428352.7
Moorey	2470.3	76	0.052	0.039	0.933	0.920	428022.7	428236.2
Friedman	2424.6	74	0.052	0.038	0.934	0.919	427981.0	428209.1
Caci	2359.6	74	0.052	0.039	0.936	0.922	427916.0	428144.2
Brandberg	2774.6	74	0.056	0.042	0.925	0.907	428331.0	428559.2
Dunbar	2171.0	74	0.049	0.037	0.941	0.928	427727.4	427955.6
Dunbar, higher-order	2190.9	75	0.049	0.038	0.941	0.928	427745.3	427966.1
Bifactor, 2 group-factors	1255.4	63	0.040	0.024	0.967	0.952	426833.9	427143.0
Bifactor, 3 group-factors	1814.9	64	0.049	0.033	0.951	0.931	427391.3	427693.1

Table A.2.12: Fit statistics, wording effect

Model	χ^2	DF	RMSEA	SRMR	CFI	TLI	AIC	BIC
Razavi	2025.0	71	0.049	0.035	0.945	0.930	427587.5	427837.7
Zigmond and Snaith	1476.5	70	0.042	0.026	0.961	0.949	427041.0	427298.5
Moorey	1649.7	70	0.044	0.028	0.956	0.943	427214.1	427471.7
Friedman	1406.0	68	0.041	0.025	0.963	0.950	426974.5	427246.8
Caci	1280.8	68	0.039	0.024	0.966	0.955	426849.2	427121.6
Brandberg	1365.8	68	0.041	0.025	0.964	0.952	426934.2	427206.5
Dunbar	1137.9	68	0.037	0.023	0.970	0.960	426706.3	426978.6
Dunbar, higher-order	1137.9	69	0.037	0.023	0.970	0.961	426704.3	426969.3
Bifactor, 2 group-factors	727.9	57	0.032	0.018	0.981	0.970	426318.3	426671.6
Bifactor, 3 group-factors	978.8	58	0.037	0.026	0.974	0.960	426567.2	426913.1